United States Patent

Monaco et al.

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[45] **Sept. 12, 1972**

[54] **BOX PARTITION ASSEMBLY MACHINE**

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[73] Assignee: **Moser Box Partition Co., Inc.**

[22] Filed: **Feb. 22, 1971**

[21] Appl. No.: **117,351**

[52] **U.S. Cl.** ..... **93/37 R**

[51] **Int. Cl.** **B31b 1/00**

[58] **Field of Search** ..... 93/37 R

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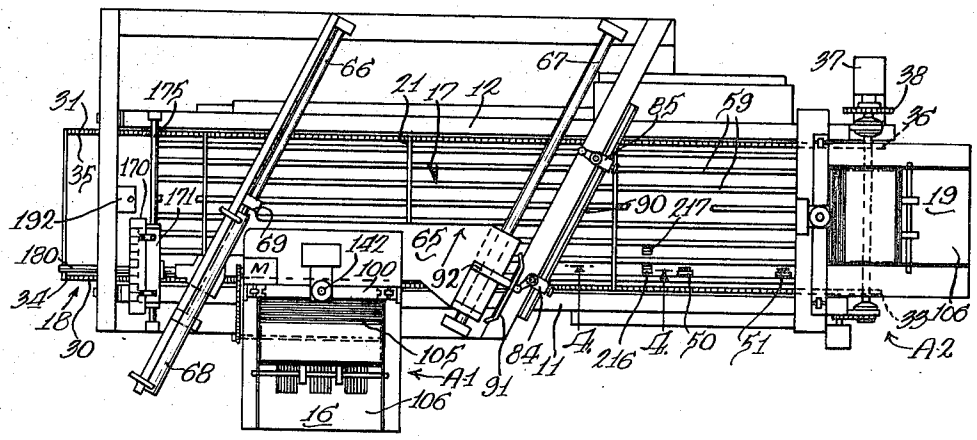
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[57] **ABSTRACT**

A box partition assembly machine having a first assembly station for depositing a plurality of longitudinal partition strips into channels of a structure and a second assembly station for inserting transverse partition strips into the longitudinal partition strips to form a box partition assembly. The first assembly station has a magazine supporting a supply of longitudinal partition strips and which moves from front to rear of the machine and intermittently deposits a longitudinal partition strip into each of a selected number of guide channels under the control of a template which may be a transverse partition strip. The magazine has a continuous, smooth motion for optimum operation. The machine is constructed for easy set-up to handle a variety of partition strips both as to the dimensions thereof as well as to the spacing of the slots in the partition strips and it is also constructed to provide for maximum speed of operation. The machine has partition ejecting structure associated with each magazine including bite elements which can be simply adjusted for the particular partition strips to be ejected.

18 Claims, 18 Drawing Figures



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SHEET 1 OF 6

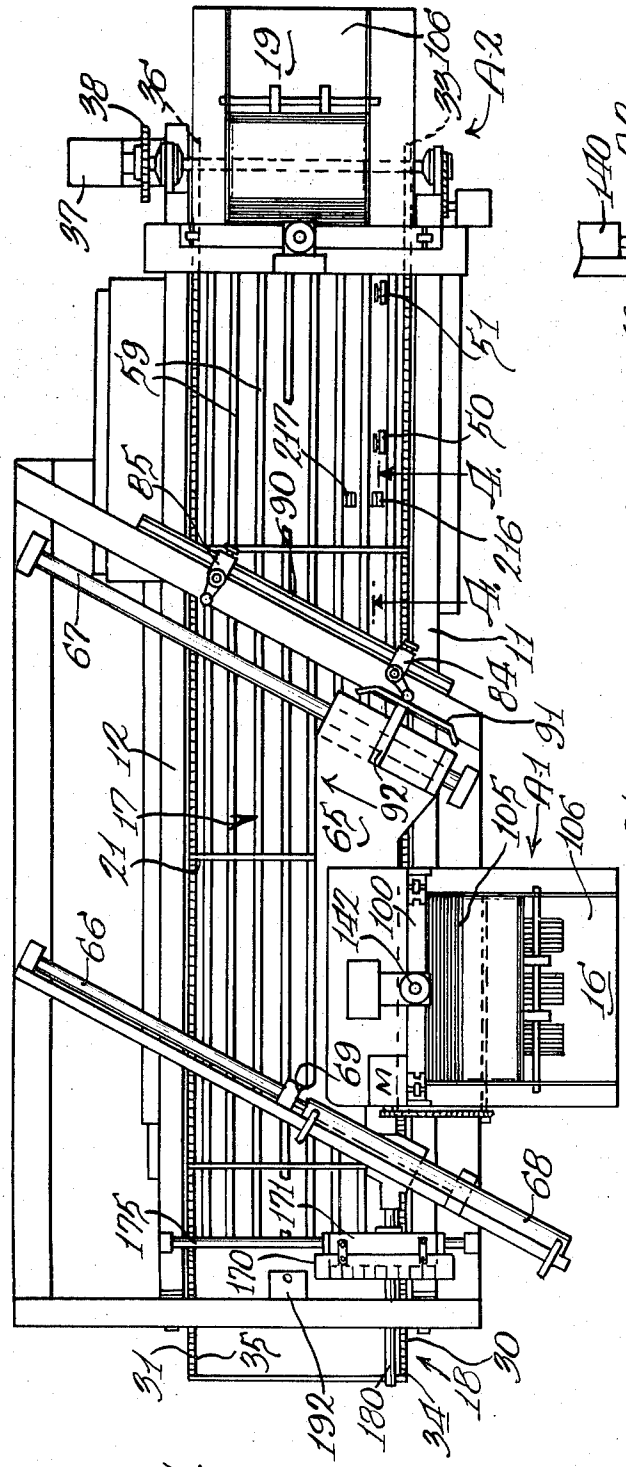


FIG. 1.

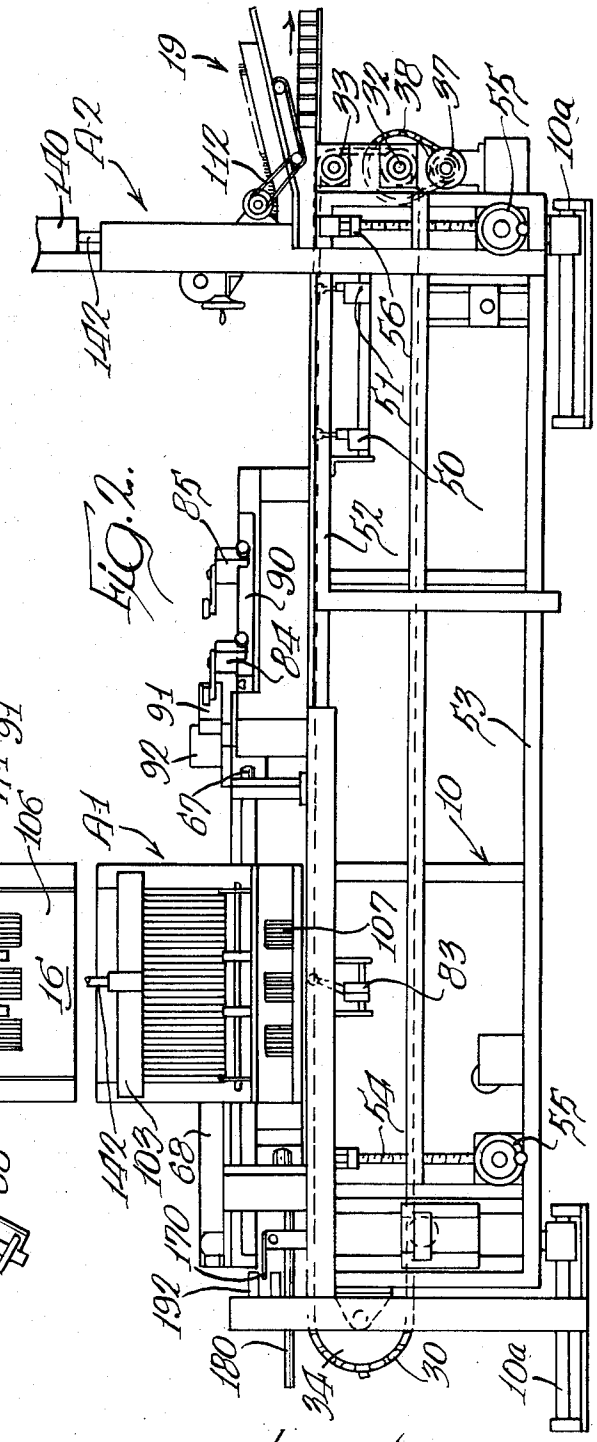


FIG. 2.

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Attys

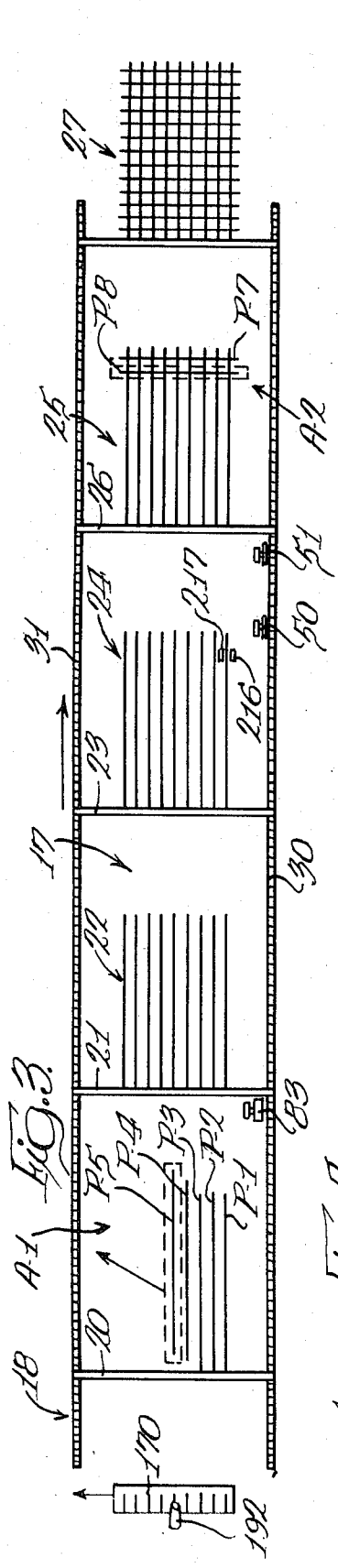


FIG. 3.

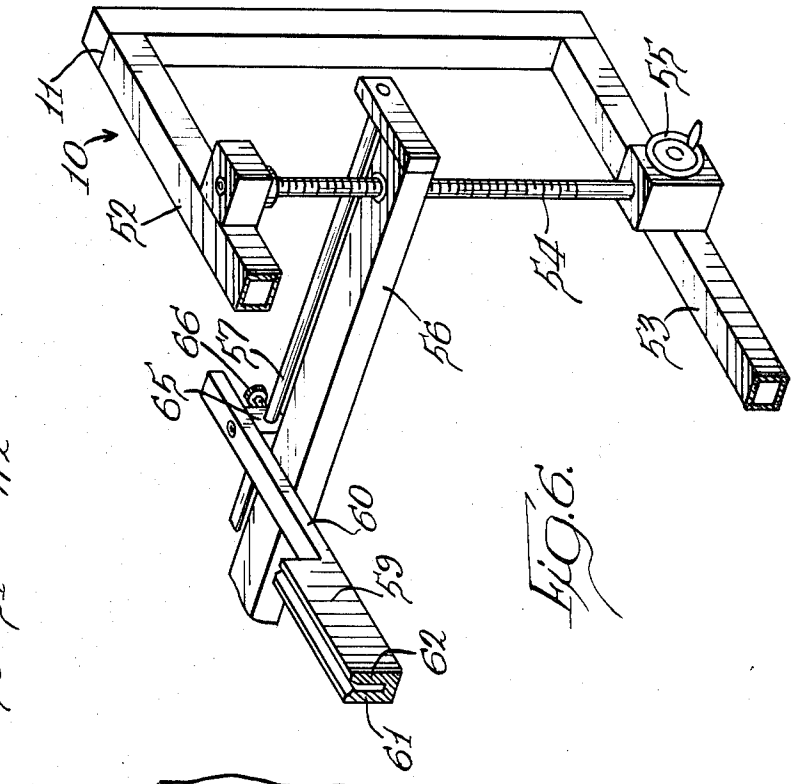


FIG. 6.

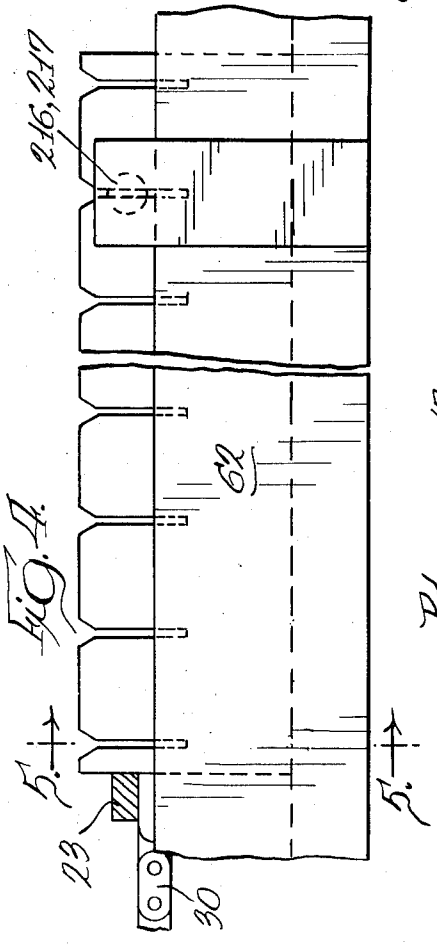


FIG. 4.

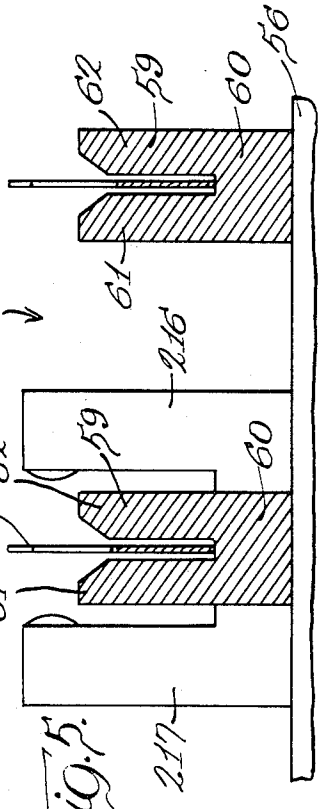


FIG. 5.

Fig. 12.

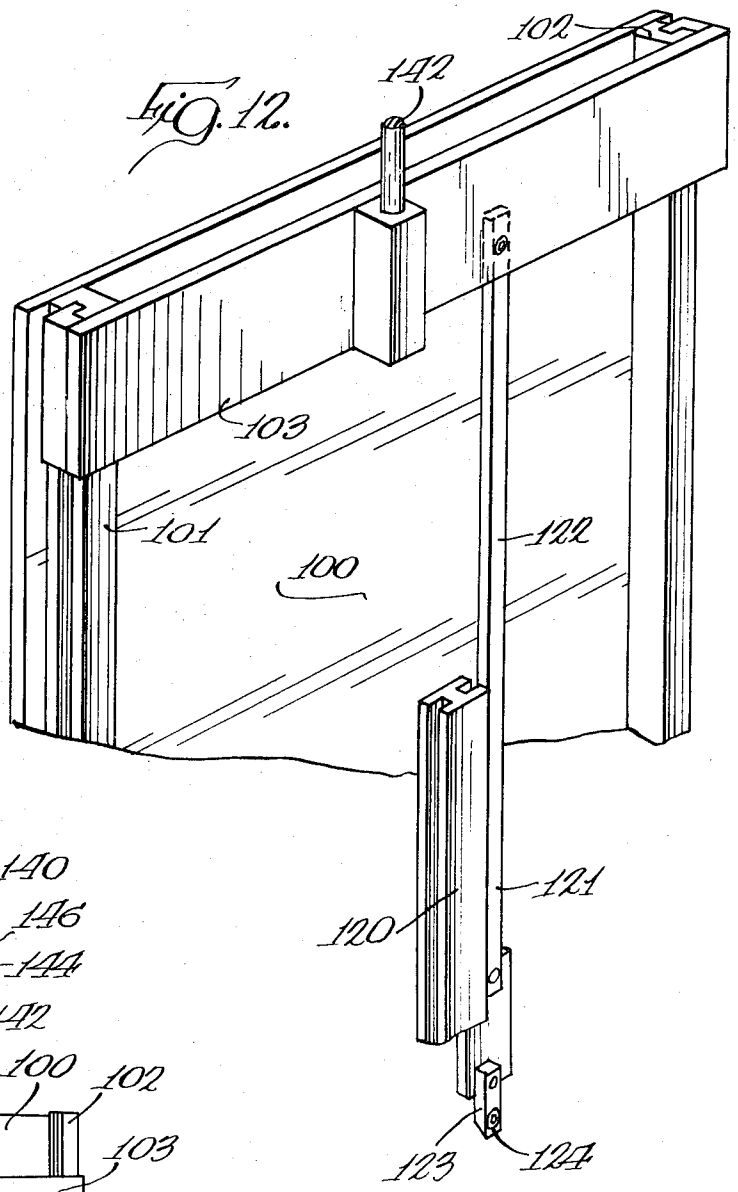

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Fig. 7.

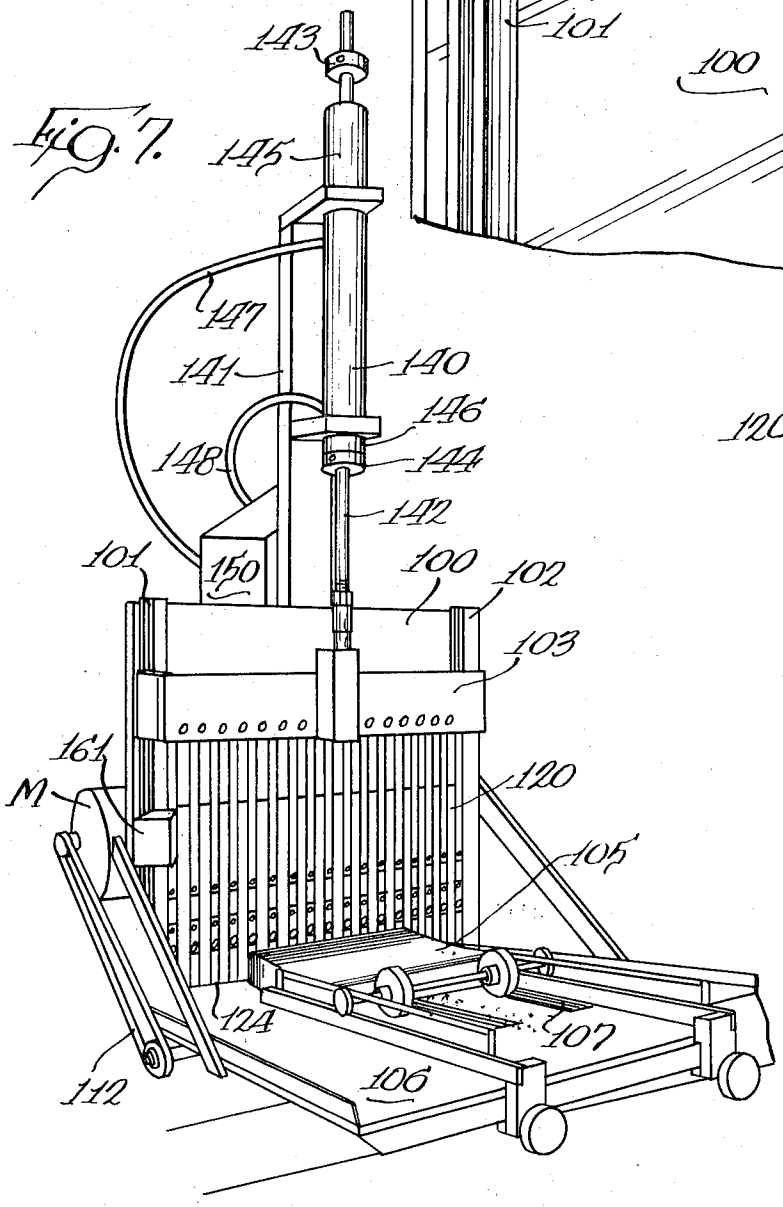

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12A
107
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106

Fig. 10.

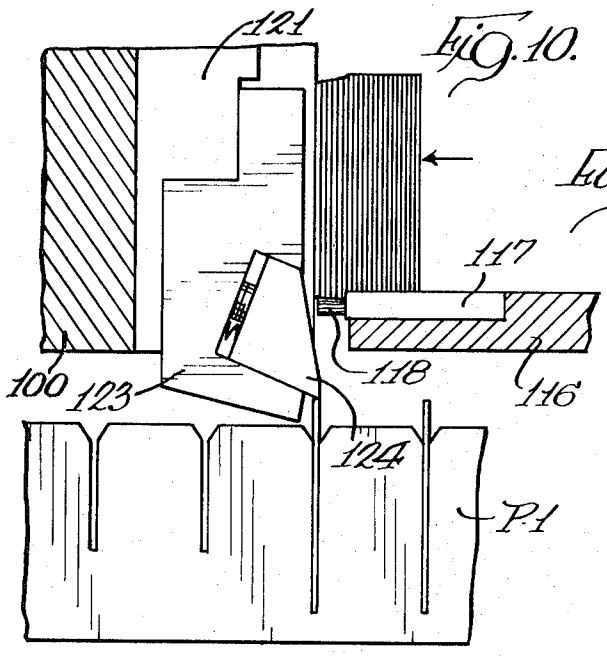


Fig. 11.

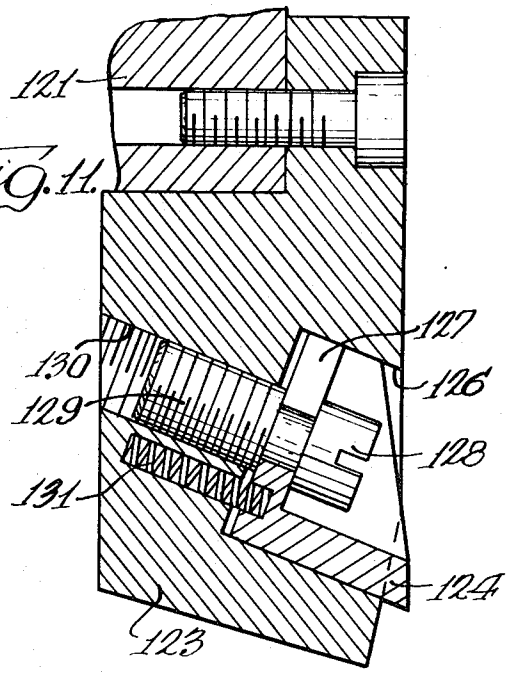


Fig. 8.

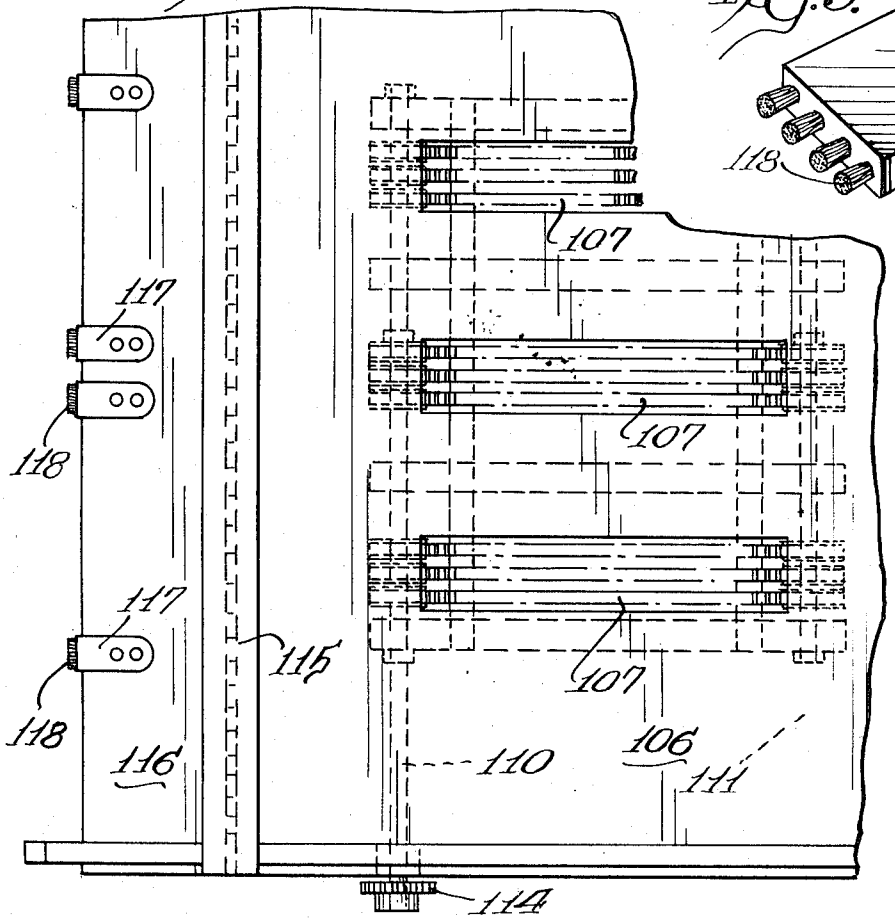
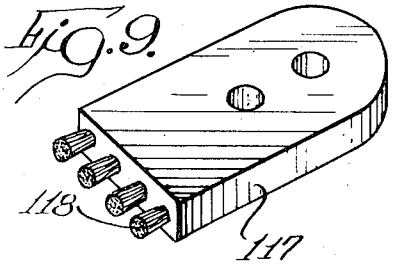


Fig. 9.



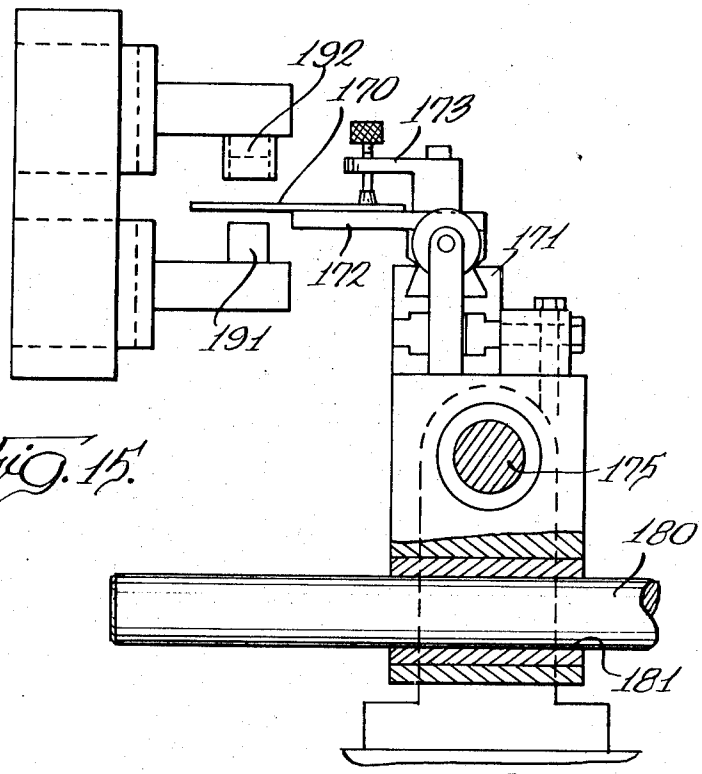


Fig. 15.

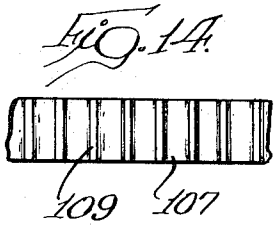


Fig. 14.

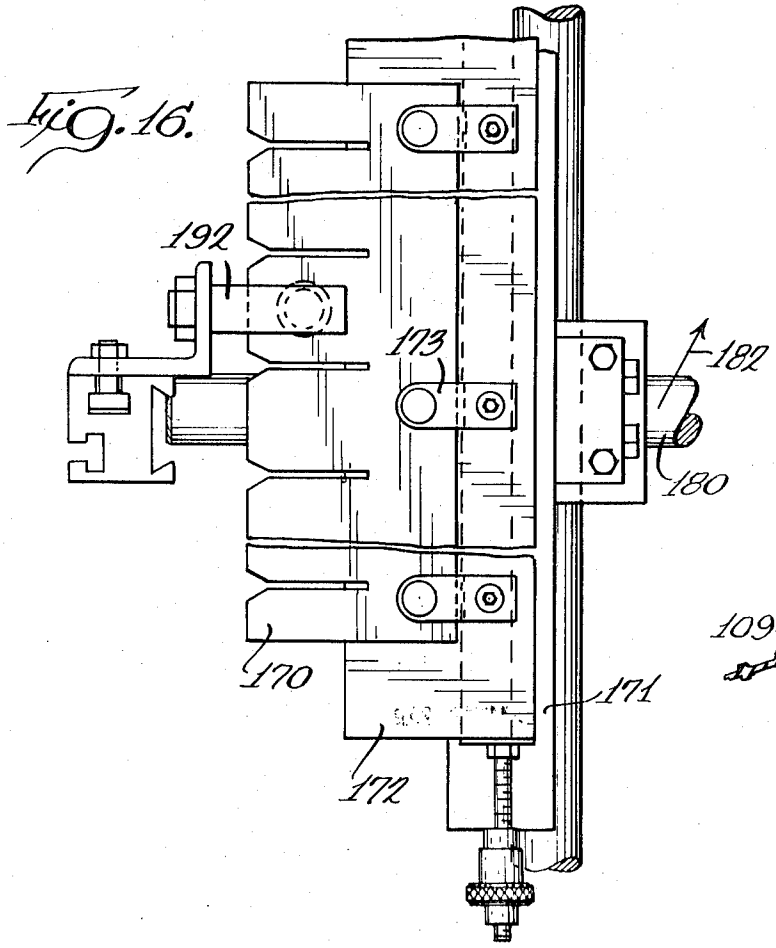


Fig. 16.

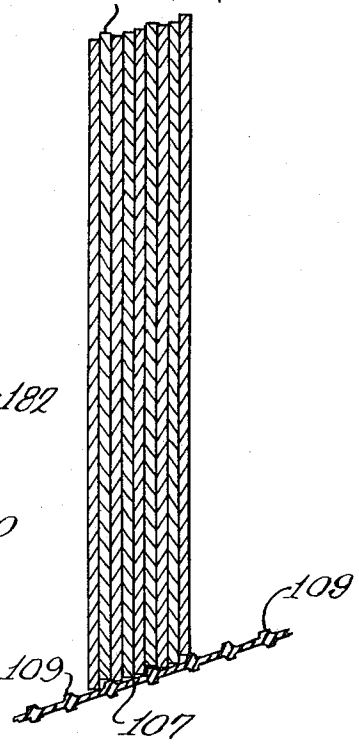


Fig. 13.

Fig. 17.

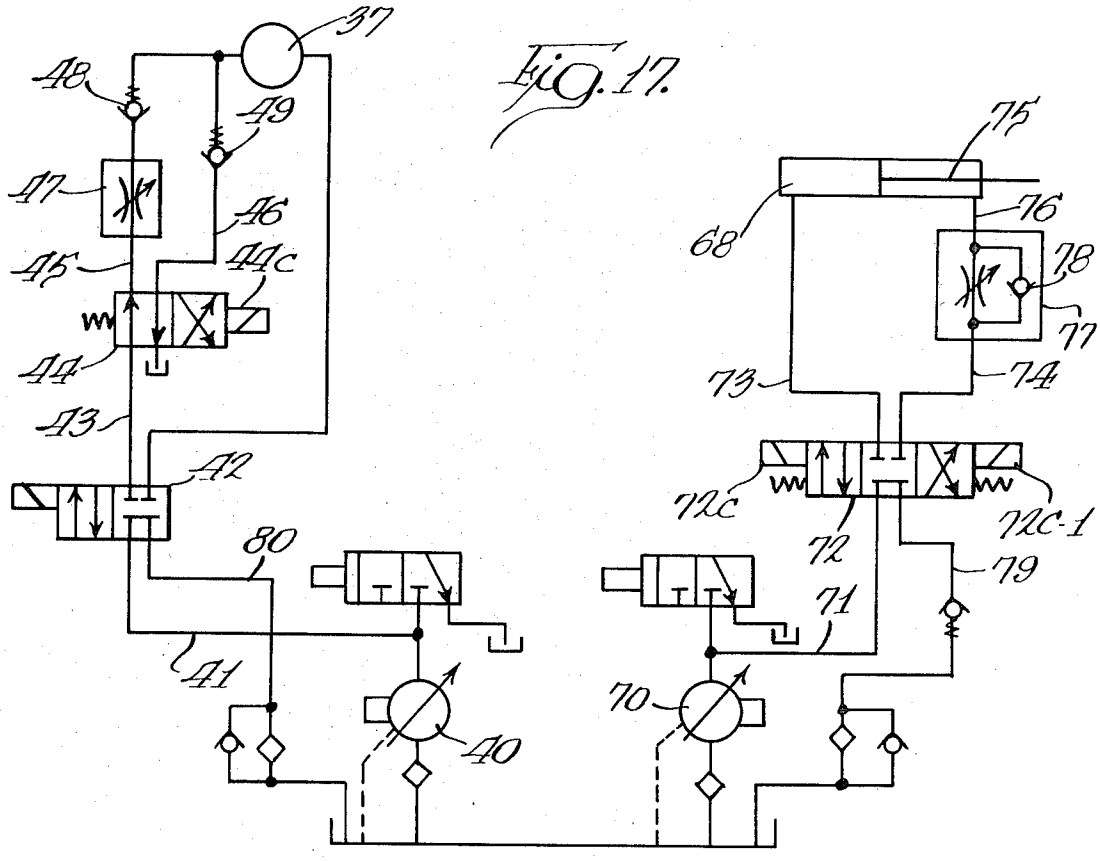
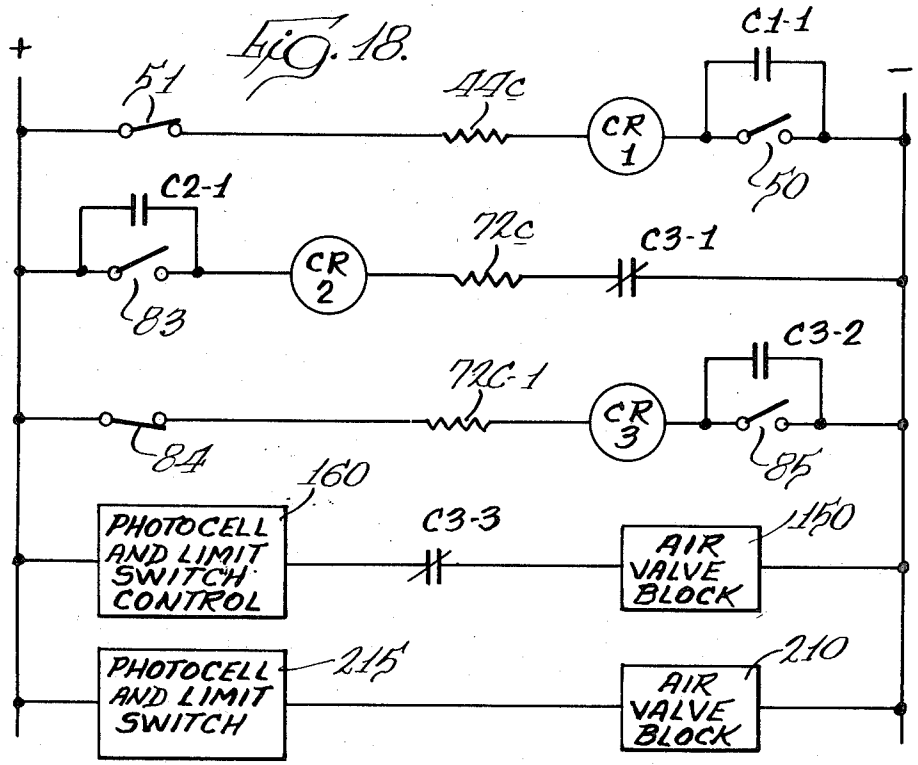

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48
49
47
46
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44c
44
43
42
80
41
40
75
68
76
78
77
73
74
72c
72
72c-1
79
71
70

Fig. 18.


+
51
44c
CR 1
C1-1
50
C2-1
83
CR 2
72c
C3-1
72c-1
CR 3
C3-2
84
85
160
PHOTOCELL AND LIMIT SWITCH CONTROL
C3-3
150
AIR VALVE BLOCK
215
PHOTOCELL AND LIMIT SWITCH
210
AIR VALVE BLOCK
−

BOX PARTITION ASSEMBLY MACHINE

BACKGROUND OF THE INVENTION

This invention pertains to box partition assembly machines for assembling preformed strips which extend both longitudinally and transversely of the box partition.

In the prior art, box partition assembly machines have had a series of partition hoppers at a first station, each of which had to be loaded, positioned and operated to eject individual partition strips at desired positions from front to rear of the machine. Each of these hoppers had to be adjusted along with the partition-receiving structure therebeneath, dependent upon the slot arrangement in the transverse partition strip. This cumbersome and complex structure has been replaced by the invention disclosed herein, with a single magazine which travels across the top of the machine from front to rear and under template control ejects the necessary number of longitudinal partition strips at the desired locations.

Other complex machines are known wherein a platen receives a number of longitudinal partition strips and the platen is then indexed through a sequence of positions, one of which includes a station for receiving the other partition strips. This results in a complex platen indexing structure which is not required by the invention disclosed herein.

SUMMARY

An object of this invention is to provide a new and improved box partition assembly machine which can be simply set up for handling many different longitudinal and transverse partition strips and wherein the longitudinal partition strips are deposited from a single travelling magazine and the transverse partition strips are subsequently assembled therewith and wherein the control of the ejection of both the longitudinal and transverse partition strips is directly from template control with the templates being actual longitudinal and transverse partition strips.

Another object of this invention is to provide a box partition assembly machine and as defined in the preceding paragraph wherein the first assembly station for depositing the longitudinal partition strips includes a travelling magazine which moves from front to rear of the machine and, under the control of a template in the form of a transverse partition strip, intermittently ejects longitudinal partition strips into suitably spaced guide channel structure located therebeneath.

Still another object of the invention is to provide a box partition assembly machine as defined in the preceding paragraph wherein said magazine travels along a diagonal path from front to rear of the machine to deposit successive longitudinal partition strips into the guide channel structure and with an endless conveyor having a pusher bar for moving the deposited partition strips and with the diagonal path of travel permitting advance of the initially-deposited partition strips by the conveyor while the last several partition strips are still in the process of being deposited.

A further object of the invention is to provide a box partition assembly machine as defined in the preceding paragraphs wherein the second assembly station has a magazine and ejection structure and wherein the control of the ejection of transverse partition strips into longitudinal partition strips passing therebeneath is under the control of a detector which reads the slots in a longitudinal partition strip being advanced toward the second assembly station.

A further object of the invention is to provide a box partition assembly machine wherein the ejection structure includes a plunger having a plurality of adjustable bites associated therewith wherein each bite includes a bite element which can be simply adjusted to have the proper extension to engage a partition strip.

Other objects of the invention are to provide a box partition assembly machine having: guide channel structure for the longitudinal partition strips which can be adjusted both laterally and vertically to compensate for the height of the partition strips being used as well as to adjust for the slot spacing in the transverse partition strips; structure associated with each of the magazines at the two assembly stations to facilitate reliable operation, including feed of partition strips to the ejection position by mechanism including timing gear belts which break up the clinging tendency of the partition strips and with support brushes at the ejection position having bristles to permit passage of the lead partition strip being ejected while retaining adjacent partition strips; and optimum speed of operation being provided by adjustment of the speed of operation of the conveying mechanism for the longitudinal partition strips to speed up the conveyor for an interval of time when operating with longitudinal partition strips of less than maximum length.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the box partition assembly machine;

FIG. 2 is a front elevational view of the box partition assembly machine;

FIG. 3 is a diagrammatic view of the sequence of operation of the box partition assembly machine;

FIG. 4 is a fragmentary section on an enlarged scale taken along the line 4—4 in FIG. 1;

FIG. 5 is a vertical section, taken generally along the line 5—5 in FIG. 4;

FIG. 6 is a fragmentary, perspective view of the guide channel structure and the adjustment structure therefor;

FIG. 7 is a perspective view of the magazine and ejection structure at one of the assembly stations;

FIG. 8 is a fragmentary plan view of the magazine structure shown in FIG. 7;

FIG. 9 is a perspective view of one of the brush elements utilized in the magazine;

FIG. 10 is a vertical fragmentary view showing the insertion of a transverse partition strip into a longitudinal partition strip;

FIG. 11 is a vertical section of the adjustable bite structure;

FIG. 12 is a fragmentary view of a part of the ejection structure including the adjustable bite shown in FIG. 7;

FIG. 13 is a fragmentary view of a series of partition strips in a magazine, showing the action of a timing belt therewith;

FIG. 14 is a fragmentary plan view of a timing belt;

FIG. 15 is a front elevational view of the template and associated structure, shown at the left-hand end of FIG. 2 for controlling the ejection of longitudinal partition strips, and with parts broken away;

FIG. 16 is a plan view of the structure shown in FIG. 15;

FIG. 17 is a schematic view of the hydraulic circuit for the machine; and

FIG. 18 is an across-the-line electrical diagram showing the significant electrical components for control of the machine.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The box partition assembly machine is shown generally in FIGS. 1 and 2 and comprises a main frame, indicated generally at 10, having lower parts engaging floor supports 10*a* and a pair of longitudinal front and rear frames 11 and 12. A pair of assembly stations are supported by the frame with a first assembly station indicated generally at A-1 and a second assembly station indicated generally at A-2. The first assembly station A-1 has a magazine 16 for longitudinal partition strips and structure which, together with the magazine, travel transversely from front to rear of the frame for depositing successive, spaced-apart longitudinal partition strips into guide structure, indicated generally at 17. These spaced-apart longitudinal partition strips are then advanced by a conveyor, indicated generally at 18, to the second assembly station A-2, wherein transverse partition strips supported in a magazine 19 are ejected into slots in the longitudinal partition strips in a manner to be described.

The operation is shown diagrammatically in FIG. 3 wherein at the assembly station A-1 three partition strips P-1, P-2 and P-3 have been deposited and are engaged by a flight 20 of the conveyor 18. A strip P-4 has been deposited, but is not yet engaged by the conveyor flight, while the strip P-5 is in the process of being deposited into the guide structure 17. A series of partition strips that have been deposited and are being advanced by a flight 21 of the conveyor, are indicated generally at 22. A preceding series of partition strips engaged by a conveyor flight 23 are indicated generally at 24. A series of partition strips, indicated generally at 25 and engaged by conveyor flight 26, are in the second assembly station A-2. As the partition strips of group 25 are moved through the assembly station A-2, successive transverse partition strips are placed into slots of the longitudinal partition strips to form a completed box partition, as indicated generally at 27. At the second assembly station A-2, a transverse partition strip P-7 has been deposited and a partition strip P-8 is in the process of being deposited.

As illustrated in FIG. 3, a series of longitudinal partition strips are deposited and advanced by the conveyor and pass through the second assembly station A-2 to form the final product, as shown at 27. The final product can vary substantially, dependent upon the construction of the longitudinal and transverse partition strips, with the box partition assembly machine having a number of simple adjustments of structure and cycle to accommodate the requirements of the particular partition strips that are being assembled.

The conveyor 18 is formed by a front, endless chain 30 and a rear, endless chain 31 which have the conveyor flight bars 20–26 connected therebetween as well as additional conveyor flight bars equally-spaced-apart along the entire length of the endless chains. These chains travel about a series of guide sprockets mounted on the frame 10, with there being sprockets 32 and 33 at one front corner of the frame and a larger sprocket 34 at the other front corner and with there being corresponding sprockets at the rear of the machine for the conveyor chain 31, as shown at 35 and 36 in FIG. 1. The chains 30 and 31 are driven by a prime mover in the form of a hydraulic motor 37 at the rear of the machine having a sprocket on its output shaft which drives a sprocket chain connected to a sprocket wheel 38 which is on the shaft mounting the sprockets 32 and 36. Thus, each of the chains 30 and 31 are driven by the hydraulic motor 37.

The fluid circuit for the hydraulic motor 37 is shown in FIG. 17 wherein a pump 40 of a fluid power package including a drive for the pump has an outlet line 41 supplying a two-position valve 42 which, when shifted from the position shown in FIG. 17 for operation of the hydraulic motor 37, permits flow to a line 43 extending to a valve 44. This latter valve controls flow to a pair of lines 45 and 46, with the line 45 extending to a flow control valve 47 having an adjustable flow restriction which is settable to provide a predetermined rate of flow. Flow from this flow control valve passes through a check valve 48 to the motor 37. The second line 46 has a one-way check valve 49 and also connects to the motor 37. With valve 44 positioned as shown in FIG. 17, flow from the pump passes through the flow control valve 47 to operate the motor 37 at a predetermined desired rate to result in a certain rate of advance of the conveyor 18. This provides for timed operation of the conveyor in advancing longitudinal partition strips of maximum length. When the strips are shorter than the maximum, the operation of the machine can be speeded up by having an interval of conveyor travel at an increased speed. This is accomplished by shifting the valve 44 from the position shown in FIG. 17 whereby pump flow bypasses the flow control valve 47 and flows at maximum rate through the one-way check valve 49 to the motor 37. This provides an increased rate of travel for the conveyor for an interval of time. This interval of time is determined by a pair of limit switches 50 and 51, shown in FIGS. 1 and 3, which are adjustably mounted on the frame 10 of the machine for location at a desired position for successive contact by a conveyor flight bar, such as will occur shortly in operation by successive contact of flight bar 23 with the switches 50 and 51 in FIG. 3. This operation of the switches 50 and 51 in controlling the valve 44 is shown particularly in FIG. 18 in the across-the-line electrical diagram wherein upon closure of switch 50 with switch 51 being a normally closed switch, the control relay CR-1 is energized to close a holding relay contact Cl-1 and to energize a coil 44C for the valve 44 to shift the valve from the position shown in FIG. 17. This condition continues until the switch 51 is contacted and moved to open position to break the circuit and deenergize coil 44C and return the electrical circuit to the condition shown in FIG. 18. During the interval that the coil 44C is energized, the conveyor advances at a higher speed and then returns to the slower speed when switch 51 is opened.

The conveyor flight bars 20–26 of the conveyor 18 remain at a constant height and with the adjustment of the machine for different height partition strips being accomplished primarily by vertical adjustment of the guide structure for the longitudinal partition strips.

The guide structure for the longitudinal partition strips is shown particularly in FIGS. 4 to 6 and is vertically adjustably mounted on the machine frame 10. There is an adjustment mounting at each corner of the frame, with a front corner being shown in FIG. 6. The upper and lower horizontal frame members 52 and 53 of the front frame 11 mount a rotatable threaded shaft 54 operable by a hand wheel 55 and the threaded shaft 54 has a bar 56 extending from front to rear of the machine which has a rod 57 associated therewith. The bar 56 and a similar bar at the other end of the machine support the ends of the guide structure, with the guide structure being formed as a series of individual channel members 59, shown particularly in FIG. 5. As shown therein, the channel members each have a base 60 with a pair of taller side walls 61 and 62 to form a recess for slidably receiving the partition strips P. Although a particular channel member can handle several different dimensions of partition strips by elevation relative to the frame of the machine, there can be different dimensionally constructed channels utilized in each machine by simple replacement. The ends of each channel member are supported on the end bars 56 of the adjustable frame and with the end bars having a central connecting bar (not shown) extending the length of the machine with some cross bars extending therefrom upon which the channel members can rest intermediate their ends for complete support thereof.

The spacing of the channel members for receiving the longitudinal partition strips at the first assembly station is determined by the slots formed in a transverse partition strip which is to be inserted at the second assembly station A-2. Thus, the required number of guide channels to be used are equal in number to the slots of the transverse partition strip and the spacing thereof is controlled by said slots. The spacing can be set up simply by adjustment of the channel members, with each channel member having a block 65 at an end thereof apertured to slide on the guide rod 57 and with a threaded member 66 threaded into the block and tightly engageable against the guide rod 57 to hold the guide channels in adjusted position. With the front-to-rear adjustment provided as just described and with the elevational positioning by the hand wheels 55 at each of the four corners of the machine, the adjustment can be made for vertical dimensions of the partition strips as well as the slot spacing of the transverse partition strip.

An important feature of the invention embodied in the structure disclosed herein is the system for depositing longitudinal partition strips in the guide channel structure at the first assembly station for advance to the second assembly station. This structure is shown generally in FIGS. 1 and 2 and in more detail in FIGS. 7–16. At the first assembly station A-1, the magazine 16 and structure for ejecting partition strips to the guide channel structure are mounted for movement from front to rear of the machine in a continuous, smooth motion to span the guide channels disposed therebeneath and to eject longitudinal partition strips in a controlled manner successively one into each of the guide channels. This structure includes a slide frame 65 movably mounted on a pair of guide rods 66 and 67 mounted to the frame and extending from the front to a location beyond the rear of the frame. These guide rods guide the slide 65 in its path of travel back and forth and are disposed at a diagonal, as shown in FIG. 1, to further speed up the operation by enabling a conveyor flight, such as conveyor flight 20 shown in FIG. 3, to engage and start advancing the initially deposited partition strips, such as P-1 to P-3, shown in FIG. 3, while other partition strips are still being deposited in a cycle of operation, as shown for strip P-5 in FIG. 3. With this structure, a single magazine 16 can be loaded with a number of longitudinal partition strips and the single magazine used to feed all of the channels of the guide structure required in a particular operation.

The slide 65 is operated by a fluid cylinder 68 mounted on the frame and having a rod 75 connected to the slide at 69. The hydraulic cylinder 68 is shown in the fluid circuit of FIG. 17 wherein fluid is supplied from a pump, such as pump 40, or a second pump 70 with the pump output flowing through a line 71 to a valve 72. Flow from valve 72 can be either through a line 73 or a line 74, with the valve positioned in either of its off center positions, while flow is blocked in the center position shown in FIG. 17. When the valve shifts to the right, as shown in FIG. 17, flow is through line 73 to extend the cylinder rod 75 and move the slide 65 from front to rear, as viewed in FIG. 1. Flow out from the rod end of the cylinder through a line 76 is to a flow control valve 77 to the line 74 and through valve 72 to tank. The flow control valve 77 assures that the stroke of the slide will be in a smooth, controlled fashion. When the valve 72 is shifted to the left as viewed in FIG. 17, flow from the pump is then through line 74 and through a bypass check valve 78 for fast return of the cylinder rod and return of the slide 65 to its forward, rest position without any restriction in the flow. The tank line is shown at 79 with a tank line 80 also being in the circuit for the fluid motor 37 for the partition strip conveyor 18.

The control of the valve 72, which is a double-acting solenoid valve with a coil 72C at one end and a coil 72C-1 at the other end, is provided by three switches 83, 84 and 85, shown in FIG. 18. The switch 83 is a normally open switch and is positioned as shown in FIGS. 1 and 3 for engagement by a conveyor flight after it has moved a series of longitudinal partition strips out of the first assembly station A-1. This is the signal required to start the slide 65 moving toward the rear to deposit the next set of longitudinal partition strips. This will be evident from FIG. 3 where it is noted that the conveyor flight bar 21 has passed by the switch 83 and, at the time of engagement therewith, has caused the slide 65 to start whereby the partition strips shown at P-1 through P-5 have been deposited. The switch 83, as shown in the across-the-line diagram, upon closure, energizes a relay CR-2 and the solenoid coil 72-C to shift the valve 72 to the right and start movement of the slide 65. The control relay contact C2-1 maintains the control relay and coil 72C energized until switch 85 is closed to energize control relay CR-3 which opens relay contact C3-1 to deenergize control relay CR-2 and the solenoid coil 72C. Closure of switch 85, as well as energizing relay CR-3, energizes solenoid coil 72C-1 to shift the control valve 72 to its left-hand position as viewed in FIG. 17 to reverse the flow to the cylinder 68 and return the slide 65 to its front position. This position is sensed by the switch 84 which is normally closed

and which upon opening deenergizes control relay CR-3 which returns relay contact C3-1 to its normally closed position. With neither of the solenoid coils 72C or 72C-1 energized, the control valve 72 can then be spring-centered to its neutral position, shown in FIG. 17. The control relay CR-3 has a control contact C3-2 in parallel with switch 85 to maintain the control relay energized after reopening of switch 85 and until such time as switch 84 is opened.

The switches 84 and 85 are adjustably mounted on a rod 90 (FIG. 1) extending parallel to the path of travel of slide 65 and positioned for engagement by a cam plate 91 supported by a mounting 92 secured to the slide 65. With the slide positioned as shown in FIG. 1, a conveyor flight will close switch 83 to start the rearward movement of the slide 65 and the cam plate 91 will move off of switch 84 so that it will be in closed position. The slide moves rearwardly until the cam plate 91 engages switch 85 to close it with resulting reversal of travel of the slide until the cam plate 91 returns to a position to engage and open the switch 84. There can be some overtravel on return of the slide 65 to its front position to result in the positioning of the cam plate 91 relative to the switch 84, as shown in FIG. 1.

The slide 65 mounts a frame having a vertically-extending back plate 100 (FIG. 7) with guide bars 101 and 102 which guide a vertically-movable plunger 103 which actuates a series of bites to project a longitudinal partition strip from a supply 105 thereof resting on the platform of the magazine 16. The magazine structure 16 is shown in particular in FIG. 8 wherein the top plate 106 thereof has a series of openings and with the upper reaches of a series of timing gear belts 107 exposed through said openings to engage the underside of a set of longitudinal partition strips. These timing gear belts are shown particularly in FIGS. 13 and 14 wherein a series of spaced-apart raised projections 109 engage under the lower edges of the longitudinal partition strips P and vertically offset some of the partition strips relative to the others to break up the clinging contact therebetween and facilitate ejection of the leading partition strip for deposit into the guide channel structure beneath the magazine. The timing gear belts 107 extend between pulleys on a drive shaft 110 and pulleys on an idler shaft 111. The drive shaft 110 has a drive sprocket 114 which is driven by a chain 112 connected to a drive motor M at the rear of the mounting plate 100 and with there being a slip connection to the sprocket 114 whereby the slow drive imparted to the timing gear belts 107 is also impositive to permit slippage whereby the longitudinal partition strips P in the magazine are urged successively to the ejection position. The plate 106 is hinged by a piano hinge 115 to a front magazine plate 116 which has a series of adjustably mounted brush holders 117 mounted thereon with brush bristles 118 extending outwardly therefrom to support a leading group of partition strips P as shown particularly in FIG. 10 to enable easy movement of the leading partition strip past the brush bristles while the bristles slightly flex but still retain the remaining partition strips in the magazine.

The ejection structure for the leading partition strip at the first assembly station is shown particularly in FIG. 7 and includes the plunger 103 previously referred to. The backplate 100 has a series of H-shaped guide blocks 120 secured thereto with guide member 121 fitted in the grooves of adjacent spaced-apart guide blocks 120. This guide member 121 is connected to a bar 122 which extends to the plunger 103 and each guide member is also connected to a mounting base 123 for an adjustable bite element 124.

As shown in FIG. 7, there are a number of the bars 122 and each has an adjustable bite element 124 with a desired number being used, depending upon the length of the longitudinal partition strip. As shown particularly in FIGS. 10 and 11, one of the bite elements 124 at the assembly station A-2 is extended relative to its mounting base a distance sufficient to project outwardly and engage the leading partition strip P and move it downwardly to deposit it into a slot of a longitudinal partition strip.

Another important feature of the invention is the simple adjustment of each of the bite elements 124 provided by mounting a bite element in a mounting recess 126 in the mounting base 123 and with the bite element having a pair of spaced-apart upstanding legs, one of which is shown at 127 in FIG. 11. A threaded member 128 has a slotted head of a size to span the space between the legs and thus functions to retain the bite element in position. A threaded shank 129 threads into an opening 130 in the mounting base and with the shank also having a diameter greater than the space between the bite element legs the bite element is rotatably captured between the head and shank of the threaded member. In this manner, rotation of the threaded member positions the bite element to have a desired amount of extension thereof from its mounting base. Internally-located spring members, one of which is shown at 131 apply tension against the bite element to maintain it in adjusted position.

The plunger 103 is stroked through a cycle sufficient to carry the bite elements 124 to an upper position above the height of the partition strips P and downwardly to the position shown in FIG. 10. This movement is provided by an air cylinder 140 mounted by an upstanding frame element 141 and having a piston rod 142 extending outwardly from both ends of the cylinder, as shown in FIG. 7. This extension of the piston rod 142 out of both ends of the cylinder enables accurate control of the stroke of the plunger 103 by a pair of adjustable rings 143 and 144 adjustable along the length of the piston rod and positioned to engage bumpers 145 and 146, respectively. Air under pressure is supplied alternately to opposite ends of the cylinder through lines 141 and 148 extending between the cylinder and a control valve block, indicated generally at 150. The control of the valve block 150 is shown in the across-the-line diagram of FIG. 18 wherein the control is provided by a conventional photocell circuit and limit switch control indicated generally at 160 which is in series with a relay contact C3-3, which is normally closed.

When a partition strip is to be ejected from the magazine, the air valve 150 is operated to cause lowering of the plunger 103 by appropriate actuation of the air cylinder 140. This actuation signal is taken from a source to be described which, through a conventional photocell circuit, causes closing of the electrical line having the control for the air valve 150. The return of

the plunger 103 upwardly is caused by a limit switch 161, shown in FIG. 7, forming part of the control block 160 and which is contacted by plunger 103. This need not be set with complete accuracy, since the ring 143 on the piston rod 142 can be accurately set to determine the lowermost position of the plunger 103 and the adjustable bite elements by engaging the bumper 145.

The control for the photocell circuit of the control block 160 is shown in FIGS. 1, 2, 15 and 16, wherein a template which can be a transverse partition strip 170 is mounted on a block 171 and, more particularly, against a plate 172 thereof and held thereon by a series of grippers 173. The guide block 171 is mounted for movement along a guide rod 175 extending from front to rear of the machine and with the block 171 being moved by power derived from the slide 65. This power is obtained through a rod 180 which extends from the slide 65 and movably extends into a passage 181 in the block 171. This rod 180 has a path of movement indicated by arrow 182 similar to the path of movement of the slide 65. Therefore, it must move relative to the block 171 as it moves with the block 171 to move the latter along the guide rod 175. The block 171 carries the transverse partition strip 170 which functions as a template along a linear path corresponding to the disposition of the channels of the guide structure which will receive the longitudinal partition strips. Thus, each time a slot 185 in the transverse partition strip is sensed, this gives a signal that a longitudinal partition strip should be ejected for deposit in the guide channel beneath the magazine at that particular location of the magazine. The photocell detecting structure is indicated generally at 190 including both a light source 191 and a photocell 192. The circuit for responding to sensing of a slot 185 in the partition strip is conventional and is represented as part of the control block 160. This sensing could be done by a feeler or by pneumatic means.

The sensing of the template 170 is utilized only as the slide 65 carries the magazine and ejecting structure from front to rear as shown in FIG. 1. When the slide and associated structure return from the rear to a front position, it is necessary to disable the mechanism for detecting the slots in the template partition strip. This is effected by the control relay contact C3-3 which will be opened to disable the circuit on the return of the slide 65. Control relay CR-3 is energized to open this control relay contact when switch 85 is closed which occurs when the slide 65 reaches the rearmost position in a cycle.

The structure at both assembly stations A-1 and A-2 including the magazine as well as the ejection structure for the transverse partition strips is the same. The structure at the second assembly station A-2 need not travel, since the longitudinal partition strips are advanced relative thereto to present successive slots of a group of longitudinal partition strips to the ejection position in the second assembly station. The structure at the second assembly station being the same includes an air valve block 210, similar to the air valve block 150, as shown in FIG. 18 and with this air valve block being subject to control by a control block, indicated generally at 215, in series therewith, with the control block including both a photocell circuit as well as a limit switch control. The photocell control includes a light source 216 and a photocell 217 located, as shown in FIG. 3, which scans successive slots of a longitudinal partition strip P-1 in a group trailing the group of longitudinal partition strips which are at the second assembly station. Because of the fixed spacing of the conveyor flights 20, 21, 23 and 26, it is known that when a slot is scanned by the cell 217 there will be a similar slot at the second assembly station ejection position whereby the air valve block 210 can be actuated to cause ejection of a transverse partition strip from the magazine down into interfitting relation with the longitudinal partition strip, as shown in FIG. 10. Thus as successive slots in a longitudinal partition strip are sensed the valve block 210 is activated for a series of ejections of transverse partition strips to end up with the product shown at 27 in FIG. 3. The limit switch for upward return of the ejection structure in the control block 215 is the same in function and position as the limit switch 161 of the control block 160.

With the structure disclosed herein, it is possible to load longitudinal partition strips in a single magazine for supplying a number of guide channels which guide the partition strips to a second assembly station. It is not necessary to load a series of magazines at the first assembly station as in prior machines. The utility of the machine is greatly enhanced by the simple adjustments providing for dimensional variations in the partition strips with the guide channel structure being adjustable both in elevation and lateral spacing and with the control of deposit of longitudinal partition strips being accomplished simply by using as a template a transverse partition strip which is scanned as the magazine and ejecting mechanism at the first assembly station moves smoothly across from front to rear of the machine. This path of movement is at a diagonal whereby the speed of the machine is maximized since some partition strips near the rear of the machine are still to be deposited while the advancing conveyor is already advancing some of the initially-deposited longitudinal partition strips. The versatility of the machine is further enhanced by the adjustable bite elements which do not require any disassembly for adjustment. A screw driver can be used to adjust the bite elements to compensate for the thickness of the partition strip. In addition to the foregoing, improved operation of a box partition assembly machine is as set forth in the description given herein.

We claim:

1. A box partition assembly machine for assembling preformed partition strips which extend both longitudinally and transversely comprising, a frame having a pair of assembly stations, guide structure on said frame and extending between said stations for guiding a series of longitudinally-disposed strips in spaced-apart relation to said second assembly station, a first partition strip magazine at said first assembly station movably mounted on said frame to travel along a path across and above said guide structure, means for moving said magazine in said path in one continuous smooth motion, means for ejecting a plurality of partition strips successively from said first magazine and depositing said strips into the guide structure as the first magazine moves, a partition strip advancing conveyor movable along the guide structure to advance the partition strips in said guide structure through the second assembly

station, a second partition strip magazine at the second assembly station, and means associated with said second magazine for ejecting transverse partition strips to move into nested relation with the longitudinal partition strips.

2. A box partition assembly machine as defined in claim 1 wherein the path of travel of said first partition strip magazine is at a diagonal to the length of the guide structure and the path of said strip advancing conveyor whereby said conveyor can engage and advance one or more of the deposited partition strips as said magazine is depositing one or more additional strips near the end of its travel.

3. A box partition assembly machine as defined in claim 1 wherein said partition strip ejecting means includes a movable plunger on said first magazine, means on said magazine for stroking said plunger each time a longitudinal partition strip is to be ejected and deposited into said guide structure, and a circuit for controlling said stroking means including a detector movable with said first magazine for detecting a template mounted on said frame adjacent said detector, said template shaped to correspond to the slots in a transverse partition strip.

4. A box partition assembly machine as defined in claim 3 wherein said template is a transverse partition strip and said detector is a photocell.

5. A box partition assembly machine as defined in claim 1 wherein said frame has a vertically adjustable table, said guide structure for longitudinal partition strips being mounted on said table and including a series of individually adjustable channels with open upper ends, whereby the table can be adjusted to assure proper deposit of partition strips of different heights into said guide structure and the spacing between said longitudinal partition strips can be varied by adjustment of said channels to accommodate different slot spacing in the transverse partition strips.

6. A box partition assembly machine as defined in claim 1 wherein said partition strip ejecting means includes a movable plunger on said first magazine, said first magazine having a hopper for holding a plurality of partition strips, means associated with said hopper for urging said plurality of partition strips in a direction to position a leading partition strip at an ejection position in said magazine, and a plurality of adjustable bites connected to said plunger to engage an edge of the leading partition strip and eject said last-mentioned partition strip by continued movement of the plunger.

7. A box partition assembly machine as defined in claim 6 wherein said adjustable bites each have a mounting base operatively connected to said plunger, each base having a recess for movably receiving a bite element which engages a partition strip, a threaded bolt rotatably connected to a bite element and adjustably threaded into said base to control the extension of said bite element out of its mounting recess dependent upon the thickness of a partition strip, and spring means acting between said base and said bite element to hold tension on said bite element in adjusted position.

8. A box partition machine as defined in claim 6 wherein said magazine has a series of brushes located to support the leading partition strip at said ejection position and several adjacent partition strips, said brushes flexing as said leading partition strip is ejected therepast but which hold said adjacent partition strips in the hopper.

9. A box partition machine as defined in claim 6 wherein said partition strip urging means includes a series of timing gear belts extending along the bottom of the hopper and engageable with the lower edges of the partition strips in the hopper whereby the raised sections of the timing belt provide positive advancing teeth to assure advance of the partition strips, and means for yieldably driving said belts.

10. A box partition assembly machine as defined in claim 1 wherein said first partition strip magazine has a rest position at the front of said frame, said partition advancing conveyor has a spaced series of transverse bars for advancing successive sets of longitudinal partition strips, and means responsive to approach of a transverse bar to said first assembly station to initiate movement of said first partition strip magazine through a strip depositing cycle.

11. A box partition assembly machine as defined in claim 1 whereby means are provided for moving said partition advancing conveyor at different rates of movement with speed-up reducing the over-all assembly time, and means for detecting the position of the conveyor to control the time of operation at the faster rate.

12. A box partition assembly machine as defined in claim 1 wherein said ejecting means for the second partition strip magazine includes a plunger, and means for stroking said plunger including a circuit having a photocell detector positioned in advance of said second assembly station to scan a longitudinal partition strip being moved by the strip advancing conveyor.

13. A box partition assembly machine for assembling preformed partition strips which extend both longitudinally and transversely comprising, a frame having a pair of assembly stations, guide structure on said frame and extending between said stations for guiding a series of longitudinally-disposed strips in spaced-apart relation to said second assembly station, a first partition strip magazine at said first assembly station movably mounted on said frame to travel along a path across and above said guide structure, means for moving said magazine in said path in one continuous smooth motion, means for ejecting a plurality of partition strips successively from said first magazine and depositing said strips into the guide structure as the first magazine moves, a partition strip advancing conveyor movable along the guide structure to advance the partition strips in said guide structure through the second assembly station, a second partition strip magazine at the second assembly station, means associated with said second magazine for ejecting transverse partition strips to move into nested relation with the longitudinal partition strips, means for driving said strip advancing conveyor at a unitform rate of speed required to advance longitudinal partition strips of a maximum length, and means for moving said conveyor at an increased speed for a time interval when shorter longitudinal partition strips are used.

14. An assembly machine as defined in claim 13 wherein said driving means includes a hydraulic motor and a fluid circuit therefor including a flow restriction, and said speed increasing means includes a pair of switches operated by the conveyor to periodically render said flow restriction inoperative.

15. A box partition assembly machine for assembling preformed partition strips which extend both longitudinally and transversely comprising, a frame having an assembly station, a partition strip magazine at said station, and means for ejecting a partition strip from said magazine including a movable plunger, a plurality of mounting bases connected to said plunger for movement therewith, a recess in each of said bases, a plurality of movable bite elements adjustably mounted one in each of said recesses to control the projection thereof outwardly of the recess dependent upon the thickness of a partition strip, and threaded means for adjusting said bite elements.

16. An assembly machine as defined in claim 15 wherein said threaded means includes a bolt threaded into said base and rotatably engaging said bite element, and spring means acting between said base and bite element to hold tension on said bite element in adjusted position.

17. An assembly machine as defined in claim 15 wherein said magazine has a series of flexible brushes supporting a partition strip in position for ejection.

18. A box partition assembly machine for assembling preformed partition strips which extend both longitudinally and transversely comprising, a frame having a pair of assembly stations, guide structure on said frame and extending between said stations for guiding a series of longitudinally-disposed strips in spaced-apart relation to said second assembly station, means at said first assembly station for depositing said series of longitudinally-disposed strips, means for advancing said last-mentioned strips along the guide structure to the second assembly station, a partition strip magazine at the second assembly station, means associated with said magazine for ejecting transverse partition strips to move into nested relation with the longitudinal partition strips and means for scanning successive slots in a travelling longitudinal partition strip to control said ejecting means at the second assembly station.

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